UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

SEPTEMBER 1945

EROSION CONTROL PRACTICES DIVISION

Equipment Is Important in Crop Residue Utilization - Hugh C. McKay, St. Anthony, Idaho.-"The type of equipment available for use in crop residue utilization farming determines to a large extent its success or failure. This was born out in this year's sweet clover trials. In the sweet clover trials we have three dates of tillage for green manure, where we turn the sweet clover under and where we leave it on the surface. In the last date of tillage with a subsurface implement there was over 3 tons of dry sweet clover residue on the surface. While it was impossible to rod weed the moldboard plowed plots, it was possible to rod weed the subsurface tilled plots. During the rod weedings, however, the residue accumulated in piles. Several farmers did not believe that we could ever seed the plots. Just before seeding we ran over the plots with the Dunham culti-hoe. This broke the large sweet clover stalks into small pieces and distributed the piles quite evenly over the plots. A seven-inch single disk press wheel drill was then used for seeding and no difficulty was encountered from the heavy sweet clover residue. This type of drill will seed through quite heavy residue because the weight of the drill is on the disks and on the press wheels. In normal crop years, this type of drill will handle the residue in this area."

Drought Tests Grasses - Joel E. Fletcher, Tucson, Arizona.-"The deficient rainfall in September furnished a good opportunity to study the drought resistance of Lehmans lovegrass seedlings. So far they have stood up well under the severe growing conditions.

"Another new grass which seems to give promise of utility in this area is Eragrostis superba. To date, this year's planting looks good."

Potato Yields - L. T. Kardos, Durham, New Hampshire.-"During the period September 20-27, the potatoes at the Northwood and Strafford Ridge experimental areas were harvested with the assistance of other members of the staff.

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"The average yield of potatoes from the 24 plots on the eroded soil at Strafford Ridge was 154.5 bushels of U.S. No. 1. The lowest yield was 110.7 bushels and the highest 198.7 bushels. The three highest yielding plots were those which received organic additions in the form of green manure (rye grass, crimson clover, winter rye).

"The average yield of potatoes from the six runoff plots at Northwood Ridge was 289.7 bushels of U.S. No. 1. The lowest yield was 244.3 bushels and the highest 332.8 bushels. The average yield of the winter rye plots was 22 bushels greater than the non-green manured plots but 24.8 bushels less than the clover-rotation plots."

Field Capacity of Different Soil Types - T. G. Peele, Clemson, South Carolina.-"One of the soil values needed in planning irrigation systems is 'field capacity.' The Soil Conservation Service engineers, who are preparing cost estimates of some proposed irrigation work near Charleston, South Carolina, requested data on 'field capacities' of different soil types in that area for use in estimating the quantities of water that would be required for irrigation. Field capacities on these soils were estimated from moisture equivalent determinations.

"The actual field capacities of a number of South Carolina soils were determined by collecting soil samples 3 or 4 days after the soil had been thoroughly wet by rain. These values were plotted against moisture equivalent values and a calibration curve manually fitted to the points. The ratios of field capacity to moisture equivalent were read from this calibration curve and are listed in Table 1. These ratios may be used in estimating 'field capacity' when the moisture equivalent is known. This is done by multiplying the moisture equivalent value by the ratio in Table 1 that is listed for that particular moisture equivalent value or the one nearest to it.

"Some 'field capacity' values determined in the field together with 'field capacities' estimated from moisture equivalents are listed for comparison in Table 2. On the whole, the two methods agree quite well, at least sufficiently well for estimating water requirements for irrigation purposes.

"Table 1.-Relation of Field Capacity to Moisture Equivalent

Moisture equivalent	Ratio of field capacity to moisture equivalent
2	2.750
3	2.000
4	1.625
5	1.400
6	1.333
7	1.214
8	1.188
9	1.144
10	1.100
11	1.091
12	1.083
13	1.054
14	1.050
15	1.040
16	1.038
17	1.035
18	1.028
19	1.021
20	1.015
21	1.000
22	0.991
23	0.987
24	0.975
25	0.968
26	0.962
27	0.948
28	0.943
29	0.931
30	0.923
31	0.919
32	0.913
33	0.903
34	0.897
35	0.889
36	0.883
37	0.878
38	0.871
39	0.867
40	0.860

"Table 2.-Comparison of Field Capacities Determined in the Field with Values Estimated from the Moisture Equivalents

Soil type	Horizon	Depth of sample	Moisture equivalent	Field capacity (determined in field)	Field capacity estimated from F.C. ratios in M.E., Table 1
		Inches			
South Carolina soils					
Cecil c. l.....	A	3-5	22.1	21.1	21.9
Cecil c. l.....	B	10-12	26.3	24.5	25.3
Hiwassee s. l.....	A_1	2-4	7.1	8.2	8.6
Hiwassee s. l.....	B_1	10-12	17.0	18.8	17.6
Hiwassee s. l.....	B_2	24-26	17.7	19.3	18.2
Hiwassee s. l.....	A	3-5	7.7	9.2	9.1
Hiwassee s. l.....	B_1	12-14	12.3	12.7	13.3
Lloyd c. l.....	A	2-4	13.9	13.4	14.6
Lloyd c. l.....	B	7-9	28.7	26.7	26.7
Cecil s. l.....	A	4-6	11.6	11.1	12.6
Cecil s. l.....	A	2-4	12.3	15.0	13.3
Cecil s. l.....	A	3-5	13.0	13.4	13.7
Cecil s. l.....	B	12-14	22.6	23.2	22.3
Cecil s. l.....	A	4-6	11.9	12.8	12.9
Cecil s. l.....	A	4-6	12.6	12.9	13.3
Cecil s. l.....	B	11-13	25.6	25.1	24.6
Cecil c. l.....	A	3-5	18.0	17.5	18.5
Cecil c. l.....	B	11-13	21.5	22.0	21.3
Durham s. l.....	A_1	5-7	10.4	12.0	11.4
Durham s. l.....	A_2	11-13	10.1	12.5	11.1
West Vir. soils, Ref. 1					
Gilpin silt loam.....		0-6	28.5	28.0	26.5
Westmoreland silt loam		0-6	31.0	29.9	28.5
Wheeling f. sandy l..		0-8	19.9	24.1	20.2
Upshur clay.....		0-5	31.1	26.6	28.6
Monongahela silt loam		0-5	27.9	29.9	26.3
Holston silt loam....		0-6	23.6	23.7	23.0
Oregon soils, Ref. 2					
Meyer silty clay loam		0-12	27.3	25.0	25.9
Meyer clay adobe soil		0-12	30.9	29.7	28.4
Meyer clay adobe soil		0-12	38.3	33.0	33.4
California soils, Ref. 3					
Tehama loam.....			14.1	15.2	14.8
San Joaquin loam.....			17.9	19.2	18.4
Columbia sand.....			17.9	21.5	18.4
Columbia silt loam...			17.2	19.5	17.8
Columbia silt loam...			19.6	22.9	19.9
Sacramento silt loam.			20.0	25.0	20.3
Tehama clay.....			20.4	21.4	20.7
Farwell silt loam....			22.9	23.5	22.6
Copay clay.....			25.7	25.5	24.7
Aiken loam.....			26.6	25.4	25.2

Ref. 1.-Browning, G.M. Relation of field capacity to moisture equivalent in soils of West Virginia. Soil Sci. 52:445-450. 1941.

Ref. 2.-Work, R.A. and Lewis, M.R. Moisture equivalent, field capacity and permanent wilting percentage and their ratios in heavy soils. Agric. Eng. 15:355-362. 1934.

Ref. 3.-Veihmeyer, F.J. and Hendrickson, A.H. The moisture equivalent as a measure of the field capacity of soils. Soil Sci. 32:181-193. 1931.

Potato Yields - Oren R. Neal, New Brunswick, New Jersey.-"Potato yields were measured on Studies 5 and 14. Yields for the different treatments are shown in the following table:

"Potato yields - 1945

Study	Treatment	Total yield
		Bu./A
5	Continuous potatoes.....	294.3
	2-year rotation, potatoes and wheat.....	311.3
	3-year rotation, potatoes, wheat and sod	269.2
	2-year rotation, potatoes, barley, and soybeans.....	247.5
	2-year rotation, potatoes and sod.....	177.4
14	2-year rotation, potatoes and wheat-plowed.....	174.3
	2-year rotation, potatoes and wheat-subsurface tilled.....	179.7

Fertilizer Increases Yield - Dwight D. Smith.-"Large increases in yield of small grain were secured this year by the use of fertilizer. Oats on an unfertilized plot yielded 10 bushels per acre, in comparison to 28 bushels per acre on a fertilized plot. Wheat without fertilizer yielded 14 bushels per acre in comparison to 24 bushels per acre on the fertilized plot."

Field Trial Results of Tillage Methods - Carl L. Englehorn, Fargo, North Dakota.-"Test areas were harvested for yield determination from the cooperative field trials on tillage method by the first part of the month, but final threshing and yield calculation has been completed on only the two farms near Dickinson, North Dakota, with the following results:

Sample number	Subsurface, press drill	Spring plow, press drill	Subsurface, furrow drill	Spring plow, furrow drill
1	23.6	24.0	10.4	12.8
2	40.5	31.1	23.3	23.7
3	14.0	16.3	27.6	35.2
4	22.2	20.0	28.2	26.4
5	20.1	22.5	12.6	15.0
6	26.7	28.4	13.8	9.7
7	22.8	27.3	8.3	8.9
8	34.8	24.2	9.1	9.7
9	31.9	19.6	11.3	14.9
10	36.2	20.9	20.7	21.1
11	28.9	23.7	12.5	20.1
12	26.6	27.8	42.8	22.6
13	20.3	14.8	34.6	39.3
14	19.4	17.3	26.1	32.6
15	18.1	22.0	19.1	28.6
Average	25.7	22.7	20.0	21.4

Planting and Growth Data Resulting from Kudzu Spacing Test - E. C. Richardson, Auburn, Alabama.-"A kudzu spacing study was started in early 1945. In this study plants were uniformly spaced 3-1/2 feet in the drill. Rows were spaced 4, 8, 16, and 24 feet apart. The fertilizer treatments varied. In one group of plots the fertilizer treatment per acre was constant, resulting in the application of a small amount of phosphate per plant where rows were spaced 4 feet apart, and a large amount of phosphate per plant where rows were spaced 24 feet apart. In a second group of plots the fertilizer treatment per plant was constant, regardless of row spacing. The purpose of this study was to determine the rapidity of coverage resulting from the different spacings and different fertilizer treatments.

"The land was flat broken in December 1944 and plots laid out. Plants were dug on January 24, 25, and 26 from an established stand of kudzu located on the Station. They were graded as to size and planted on January 30 and 31 by the furrow method. The fertilizer was weighed out for each individual row and applied in a furrow adjacent to the row, and covered by making a second furrow.

"In September 1945, ten plants were harvested from each plot. From these samples growth determinations were made. Result: In all cases the total amount of green weight produced per acre was proportional to the number of kudzu plants planted. Slightly higher yields were obtained where a uniform application of phosphate was made per plant. In general, the weight of each individual plant, the total length of the runner and the number of runners per plant increased as the row widths increased. These differences were more outstanding where a uniform fertilizer treatment per acre was used than where a uniform fertilizer treatment per plant was used."

Effect of Vetch on Corn Yields - Russell Woodburn, State College, Mississippi.-"Corn was harvested on main plots about September 10. Yields were extremely high considering that there was less than 2.5 inches of rain between May 17 and July 23.

"Corn Yields, 1945

Following vetch			Following no vetch		
Plot no.	Slope	Yield	Plot no.	Slope	Yield
	Pct.	Bu./A		Pct.	Bu./A
1	2.5	72.6	2	2.5	69.8
3	5.0	62.5	4	5.0	61.5
5	7.5	76.5	6	7.5	63.4
7	10.0	71.0	8	10.0	74.0
9	12.5	71.0	10	12.5	74.8

"There was no significant trend toward less yield on the higher slopes or for less yields when no vetch was used. The vetch crop was very poor, however, averaging less than 3000 pounds green weight at turning time."

Grazing Studies - C. J. Whitfield, Amarillo, Texas.-"Overall gain for the period September 1 to October 1, 1945 was 54 pounds per head, or a daily average gain of 1.80 pounds per head. These higher gains are the result of much better pasture for the month of September than was available the two previous months, July and August. Gains and weights for the period September 1 to October 1 are as follows:

Lot no.	Pasture used	Type pasture	Average daily gain	Average weight per head 10/1/45
1	I-1	Native blue grama-buffalo.....	1.98	894.5
2	I-2(E)	Seeded mixture cool and warm season grasses.....	1.72	887.0
8-A	F (15 days) H (15 days)	Johnson grass and weeds; native grasses, lake weeds, reseeded winter and summer grasses.....	1.07	799.0
8-B	F (15 days) H (15 days)	Johnson grass and weeds; native grasses, lake weeds, reseeded winter and summer grasses.....	1.37	791.0
9	H	Combination lake weeds, winter and summer grasses, native and reseeded.....	2.0	884.0
10	H	Combination lake weeds, winter and summer grasses, native and reseeded.....	2.08	823.5

"Rains during the middle of August and the first part of September stimulated growth of grasses in all pastures. Steers have appeared to gain continuously throughout the month of September. On October 1, the steers show much more bloom than any period during the season. Cold rains on September 28 and 29, with a minimum temperature of 32 to 35 degrees, did not seem to damage cattle to any extent. The results reflected in gains for the period further emphasize the value in green forage."

Soil Permeability Notes - C. S. Slater, College Park, Maryland.-"We have continued to collect data with respect to permeability on local soils. In addition, Mr. Loughry of the Regional Office has furnished us with permeability data that were obtained this summer on a series of New York soils.

"Preliminary study of the data indicate that soils require a double definition of permeability: (a) In connection with tile drainage, a definition of permeability to lateral flow under a positive hydraulic head, through a system of relatively coarse capillaries and channels; and (b) In connection with natural and internal drainage, a definition of permeability to vertical flow under a tension head, through a system of finer capillaries and channels."

Effect of Manure on Oat Yields - O. E. Hays, LaCrosse, Wisconsin.- "Yield data from 4 fields and 4 plots show an average increase of oat yields of 7 bushels per acre for plots and fields top dressed with 5 tons of manure over those not manured. Manure was applied following the spring seeding of oats. Some lodging occurred on all fields and plots. However, there was no noticeable difference in the lodging on the manured areas as compared with those not receiving any manure. Fertilizer was applied at the same rate on all areas. The average yield per acre for the manured areas was 91.0 bushels per acre while those areas not receiving manure was 83.9 bushels.

"Runoff and soil loss data from the manured plots show that this top dressing decreased the soil loss by 2/3 and the runoff 1/3 for 5 storms occurring between May 20 and June 2 when the oats were at a critical stage and of little benefit in controlling erosion."

Protective Value of Vegetation in Small Waterways - Harley A. Daniel, Guthrie, Oklahoma.-"M. B. Cox is preparing his final release of data from his study of small grassed waterways on the Hydraulic Laboratory west of Stillwater. Some of his findings are as follow:

Kind of grass	Inches of soil loss per hour 1/
Short green Bermuda.....	.07
Blue grama.....	.11
Alfalfa.....	.15
Long green Bermuda.....	.18
Buffalo.....	.18
Tall native grasses.....	.22
Weeping lovegrass.....	.29

1/ The mean velocity of flow was six feet per second.

"These results show that short clipped Bermuda grass provides more protection for channels than long green unmowed grass. This work, as well as that on the Wheatland Conservation Experiment Station, Cherokee, Oklahoma, shows that alfalfa has satisfactorily protected the channels on deep soils with slopes of 2 per cent or less. The higher soil loss from the tall native grass and weeping lovegrass is largely due to the bunch type of growth."

Soil Moisture Under Corn and Soybeans - C. A. Van Doren, Urbana, Illinois.-"Soil moisture on the corn and soybean plots reached the wilting point early in September at some levels in the profile for the first time during the crop season. Soil was at the wilting point on the soybean plots for a slightly longer period and to a greater depth than on the corn plots."

Seeding Crested Wheatgrass - O. K. Barnes, Laramie, Wyoming.- "Last spring a series of plots were established at Archer to further study methods of seeding crested wheat on native range. Counts were just made of the crested wheat seedlings. The results were as follow:

	Crested wheat seedlings per 1/10 meter
Pitted range followed by semi-deep furrow drill seeding.....	.4 (in pits)
Pitted range, hand broadcasting of seed followed by harrowing.....	6.1 (in pits)
Semi-deep furrow drill seeding directly into range.....	.1

"The hand broadcast method of seeding followed by a harrow gave the best stand, in fact, the other two methods can be considered poor stands to date. It appeared that the advantage of the broadcasting and harrowing was a better covering of the seed than was accomplished with the drilling."

Grape Harvest at Hammondsport - John Lamb, Jr., Ithaca, New York.- "Harvesting the early grapes began on September 20 and was finished on September 28. An unfavorable spring caused a short crop, while the excessive rains of September were responsible for a crop of inferior quality. Sugar content of the Elvira grapes, usually 17 to 18 per cent, was 15.5 on the average for 1945. Sugar content of the mulched fruit averaged this year one per cent less than that of the cultivated, soybean cover, and clover cover. Elvira grapes sold at $205, and Concords about $127 per ton."

Hubam Clover-Oats Mixture - H. O. Hill, Temple, Texas.-"The April report from this Station showed the soil conserving value of oats-hubam clover mixture. Hubam clover in the oat mixture increases the yield of the subsequent crop of oats and in favorable years a fair crop of hubam seed may be produced after the oats are harvested. The practice of intensive cropping to small grain is used on the steeper slopes of the Blackland area where shallow soils prevail. In the test, oats after oats yielded 33.8 bushels per acre and oats in the oats-hubam mixture produced 40.7 bushels, an increase of 6.9 bushels per acre. The hubam in the oats-hubam mixture yielded 125 pounds of clover seed in addition to the 40.7 bushels of oats from the same area."

Ability of Birdsfoot Trefoil to Compete with Other Selected Legumes and with Weeds on Eroded Soils - J. M. Aikman, Ames, Iowa.-"In the spring of 1939 a randomized block experiment was initiated to determine the response of 19 of the most promising legumes for eroded soils of southern Iowa, to three combinations of edaphic and climatic conditions. For four seasons effective weed competition was controlled as well as inter-plot competition among the legumes.

"Following the 1942 growing season, the 19 selected legume species, in the 570 mil-acre plots on the three sites representing three soil types, were left to grow in competition with each other and with the weeds in the plots. By the close of the 1944 season, birdsfoot trefoil of all of the 19 experimental species was found to be most nearly independent of soil variations, hence best suited to establishment and growth on the range of soils used in the adaptation tests: (1) eroded Clinton silt loam of medium to low fertility, with no lime or fertilizer; (2) Plainfield fine sandy loam of fair to medium fertility, with 2-1/2 tons of coarse limestone and 200 pounds of phosphate per acre applied 2 years before planting; (3) eroded Lindley loam of medium to low fertility, with 3 tons of coarse limestone and 200 pounds of phosphate per acre applied 2 years before planting. Although an annual, Korean lespedeza in 1944 ranked close to birdsfoot trefoil in survival, maintenance of stand and spread. These two species covered well over half of the entire plot area in each of the three sites."

Frosted Kudzu for Winter Grazing - B. H. Hendrickson, Watkinsville, Georgia.-"Last winter samples of frosted kudzu were analyzed at two chemical laboratories. At the Georgia Experiment Station, of which Dr. H. P. Stuckey is Director, Mr. K. T. Holley analyzed three kudzu samples collected through the winter months from December to March. At Clemson, South Carolina, Dr. T. C. Peele, Supervisor of the Soil Conservation Research project, SC-R-1, analyzed a similar set of kudzu samples that we sent to him, collected at intervals during the winter.

"Both chemists found that frosted kudzu holds its nutrient value surprisingly well even though it is subjected to the leaching action of many slow winter rains. As late as March it still retained more than half its original content of protein and other nutrients.

"It is common knowledge that hay, kept wet by continued rains in warm summer weather will soon become mouldy and worthless. It seems that kudzu, on the other hand, after its top growth has been killed by frost does not deteriorate rapidly in feeding value during the cold winter months. This helps to explain why our cattle graze it freely during the winter, even though they have access to green oats and crimson clover winter grazing crops at the same time.

Kudzu as a Summer Grazing Crop for Dairy Cattle.-"Both the volume of milk produced and its butter fat content have increased this summer when dairy cows were turned into kudzu temporary pastures. This was reported by Raymond Dawson, tenant-operator of the Station 100-acre farm unit, and also by A. P. Winston, manager of the Athens Coop Creamery. Kudzu makes luxuriant growth for summer grazing at the time of year when pasture grasses tend to become less palatable and lower in nutrient content.

Hegari for Late Summer Grain Production.-"It frequently happens that corn planted just before or just after cotton, in the spring, suffers from drought periods in May, or June, and makes poor yields. Corn planted later in the summer rarely does well. But another 'corn crop' is available.

"For the last few years the grain sorghum crop - hegari - has produced good to heavy yields on Station fields, especially when planted around July 1 on good land. This crop can be grown at about half the cost of corn, since the grain can be combine-harvested.

"Early planted hegari is sometimes subject to blasting of the seed heads, and to serious attacks by the sorghum midge. But little damage has occurred when the crop is planted on good land, in July. We prefer to grow it on land where a winter legume has been either turned under for green manure, or harvested for seed leaving the combine residue on the ground. Hegari is a hard-feeding, drought resistant crop that utilizes organic matter in the soil. We let it ripen well and do not harvest it until the grain is thoroughly cured in the field.

Practical Pasture Development on Eroded Land in the Southern Piedmont.-"Six years ago a narrow 13-acre bottomland bordering a small creek on the Station property contained one small corn field. The rest was mostly covered with bushes and briars. Pasture improvement work was started, and in 2 years time a good grass-clover sod developed. A few common beef-type cattle were turned into the pasture, and a small shelter barn built.

"Poor eroded hilly upland slopes adjacent to the lowland pasture have since been gradually developed for pasture, as the herd increased. Kudzu was established on the worst eroded areas, sericea on the other thin land, and Kobe lespedeza on the balance. None of the land was suited for row cropping.

"At the present time the Angus cattle herd averages 25 to 30 head, and the areas they pasture total 31 acres, two-thirds of it reclaimed wasteland. Only the bottomland grass-clover pasture, however, is open to grazing the year around. Grazing is rotated on the upland pastures. Ten months continuous grazing is provided, without supplemental feeding, by controlled grazing."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"The station experienced the greatest September rainfall since its establishment. The total ranged from 9.29 to 11.01 inches recorded in gages about 1 mile apart. The 50-year maximum rainfall for this month is about 10.8 inches as determined from the records of the nearest United States Weather Bureau station. The droughty conditions resulting from only 1 inch of rain in August has been definitely broken.

"Total runoff as given in the following table shows that the amount varied considerable for the different watersheds.

Rainfall and Runoff for September

Watershed No.	Area	Land Use	Total rainfall	Total runoff	Remarks
	Acres		Inches	Inches	
115	1.16	Corn (straight rows)	9.29	1.50	
123	1.37	Corn (contour)	9.29	.37	
109	1.69	Corn (contour)	9.68	.46	
128	2.21	Corn (trash mulch)	10.49	1.34	Considerable seep flow
111	1.18	Corn-meadow strips	10.30	1.26	-do-
124	2.07	-do-	10.69	1.24	-do-
187	7.20	-do-	11.01	1.40	-do-
106	1.56	New meadow (prevailing)	10.49	1.74	
121	1.42	New meadow (improved)	10.49	.38	
188	2.06	-do-	10.28	1.44	
118	1.96	Meadow 1st year (prevail.)	10.70	1.27	
113	1.45	Meadow 1st year (improved)	10.30	.69	
169	29.0	Mixed cover	10.27	1.59	
177	75.6	-do-	9.51	1.33	
183	74.2	-do-	10.69	2.20	
10	122	-do-	9.84	1.47	

Note: Prevailing practices used in rotation compared with improved practices used in same rotation for single-crop watersheds.

"Most of the runoff for the month resulted from the storm of September 23 when about 3 inches of rain fell. The minimum amount for this storm of 2.33 inches was recorded in a gage only 4,300 feet away from a gage where the maximum of 3.24 inches fell. Soil moisture was exceedingly high at the time this storm occurred as 2 inches of rain fell in the preceding week and a total of 5.6 inches fell in the 2 weeks preceding the 23d. The total storm rainfall and runoff along with

maximum rainfall rates and peak runoff rates are given in the following table.

Rainfall and runoff for the storm of Sept. 23, 1945
(See preceding table for data on land use)

Watershed No.	Area	Rainfall: Total	Rainfall: Maximum 5-min. rate	Runoff: Total	Runoff: Peak	Soil loss	Remarks
	Acres	Inches	In/hr	Inches	In/hr.	Lbs/acre	
115	1.61	2.33	3.48	0.85	1.63	272	
123	1.37	2.33	3.48	.37	.38	16	
109	1.69	2.61	3.60	.42	.78	-	
128	2.21	3.18	3.12	.97	1.52	-	Considerable seepage
111	1.18	2.91	3.72	1.23	1.47	161	-do-
124	2.07	3.24	3.72	1.09	1.43	179	-do-
187	7.20	3.23	3.72	.72	.81	-	-do-
106	1.56	3.18	3.12	1.27	2.21	-	
121	1.42	3.18	3.12	.38	.59	-	
188	2.06	3.18	3.60	1.33	1.95	-	
118	1.96	3.20	3.96	1.12	1.36	-	
113	1.45	2.91	3.72	.69	1.08	-	
169	29.0	3.00	2.68*	1.20	1.37	-	
177	75.6	2.62	1.80*	.87	.72	-	
183	74.2	3.24	2.76*	1.36	1.41	-	
10	122	2.40	3.56*	.96	1.72	-	

* Maximum 15-minute rainfall rate.

"The 'improved practice' corn watersheds Nos. 109 and 123 have well defined contour furrows and good grass waterways which probably accounts for the fact that runoff from these areas was materially less than that from the straight row (prevailing practice) watershed No. 115. The average land slope on watersheds 115 and 123 is about 6 percent. As this is the first real storm of the corn season, the contour furrows were not brcken over and were quite effective in storing rain water.

"Although the maximum 15-minute rainfall rates were not the greatest recorded during the 7 years of record, the peak runoff rates for watersheds 10 and 183 greatly exceeded all other peaks at these stations.

The highest peak at station 10 recorded prior to September 23, is compared with that of September 23 in the following table.

Storm date	Runoff peak flow	Rainfall: Maximum 15-min. rate	Rainfall: Total preceding storm for - 3 days	7 days	14 days	21 days
	In/hr	In/hr	Inches	Inches	Inches	Inches
Sept. 23, 1945	1.72	3.56	0.43	2.06	5.62	6.16
June 3-4, 1941	.56	2.04	1.01	1.72	4.17	6.96

Note: The peak of September 23 was greater than that of June 3-4 primarily because of the greater rainfall rate. Antecedent moisture conditions were comparable - very wet in both cases.

"The above data on peak flows will make considerable changes in the analysis of flood flows for two of the watersheds but will not change the others at all. These data show that substantial analyses and conclusions cannot be derived from data having short periods of record. The flood-flow analysis already made will be revised to include data from the storm of September 23.

"The storms of September 14 and 23 provided an opportunity for comparing soil-loss data from watershed 109 determined by three different methods as follows:

Soil loss in runoff water (pounds per acre)

Method	Storm of - Sept. 14	Sept. 23
Silt box and Ramser sampler	28	205
Inclined-axis sampling wheel	27	307
Hand samples throughout the storm	25	242

"The quantity of eroded material and the rates of runoff are too small to draw conclusions from these data."

Hydrologic Studies - I. W. Bauer, Central Great Plains Experimental Watershed, Hastings, Nebraska.-"Very low intensity causing very little runoff resulted from the September precipitation of 2.48 inches recorded at the meteorological station. A total of 2.00 inches fell during the storm on the 27th and 28th. Before this the ground was very dry and no operations have been made since plowing to get the

ground ready for wheat. These operations will be made as soon as possible and the wheat will be planted. The terrace outlet channel was prepared for crested-wheat grass and will be seeded as soon as possible; the terraces will be built as soon as the corn is picked."

Hydrologic Studies - R. B. Hickok, Lafayette, Indiana.- "Rainfall occurred on 15 days of the month. Average totals for the Throckmorton and Dairy Experiment Farms were 6.94 and 6.33 inches, respectively, compared to the September 'normal' of 3.23 inches. There were 7 storms producing runoff from the experimental watersheds. Data have been compiled for the corn watersheds, which are summarized in the following table:

Runoff from Corn Watersheds for September, 1945
Purdue-Throckmorton Farm, Lafayette, Indiana

Water-shed No.	Treatment (1)	Total runoff		Peak rate of runoff Inches/hr	Max. 10 min. rainfall intensity (2)
		Inches	% of Rain(2)		
10	Prevailing	2.12	30.1	1.665	4.05
15	Prevailing	1.13	16.4	2.191	4.42
18	Conservation	.01	.1	.018	3.74
14	Conservation	.05	.7	.104	4.42

(1) Corn, wheat, meadow rotation, 'square' tillage and seeding, common (light) fertilization on 'prevailing' practice watersheds; same rotation contour seeding, heavy fertilization and manure plowed under for corn, heavy fertilization and manure top dressing of wheat on 'conservation' treated watersheds; 1st year of 2d rotation under differential treatment.

(2) Recorded by nearest rain gage, taking into account variation in areal distribution.

"The extremely low runoff losses from the 'conservation' treated watersheds indicated a surprising permanence of the contour ridges and sustained high infiltration capacity of the soil, enabling them to detain and absorb over 12 inches of rain, much of which has fallen at very high intensities, since the last cultivation (loosening of the soil and rebuilding of contour ridges).

"A large number of runoff samples were received in the laboratory. Analyses have been completed for total solids, organic matter, and total nitrogen. Mr. Bedell reports the losses of these constituents for the corn watersheds in the following table."

Soil, Organic Matter and Nitrogen Losses from Corn on 'Prevailing' Practice and 'Conservation' Treated Watersheds for September, 1945
Purdue-Throckmorton Farm, Lafayette, Ind.

Crop	Treatment	Wds. No.	Soil and fertility losses, lbs./acre		
			Total solids	Organic matter	Total nitrogen
Corn	Prevailing	10	861.0	45.50	3.010
	Prevailing	15	926.0	43.66	2.870
	Conservation	18	1.0	.04	.004
	Conservation	14	1.5	.14	.012

Hydrologic Studies - R. G. White, East Lansing, Michigan.-"The proposed plan to change the cropping system at the cultivated watersheds from corn, oats, brome-alfalfa 3 years to corn, corn, oats, brome-alfalfa 2 years was approved, as was the plan to farm watershed 'A' and watershed 'B' separately in such a manner as to not have corn on both watersheds the same year. The College has agreed to fence the watersheds in the spring of 1946 so that they may be farmed separately from the rest of the fields.

"It is planned to set up evaporation studies at the cultivated watersheds to supplement the other meteorlogic data being collected. Later in the month, the subject of equipment for making evaporation studies was discussed with Dr. G. J. Bouyoucos of the Michigan State College Soils Department. During this discussion, a method of adapting the Bouyoucos Gypsum Block principle to evaporation studies was suggested. Dr. Bouyoucos has been able to data to devote a limited amount of time to the development of the method. No definite conclusions have been reached as yet, but the idea has definitely shown worthiness of further laboratory study."

Hydrologic Studies - H. A. Daniel, Cherokee, Oklahoma.- "M. B. Cox is preparing his final release of data from his study of small grassed waterways in the Hydraulic Laboratory west of Stillwater. Some of his findings are as follows:

Protective Value of Vegetation in Small Waterways

Kind of grass	Inches of soil loss per hour 1/
Short green Bermuda	0.07
Blue grama	.11
Alfalfa	.15
Long green Bermuda	.18
Buffalo	.18
Tall native grasses	.22
Weeping lovegrass	.29

1/ The mean velocity of flow was six feet per second.

These results show that short clipped Bermuda grass provides more protection for channels than long green unmowed grass. This work, as well as that on the Wheatland Conservation Experiment Station, Cherokee, Oklahoma, shows that alfalfa has satisfactorily protected the channels on deep soils with slopes of 2 percent or less. The higher soil loss from the tall native grass and weeping lovegrass is largely due to the bunch type of growth."

Microbiological Studies - F. L. Duley, Lincoln, Nebraska.- "T. M. McCalla has determined the effect of different amounts of straw applied to corn on the degree and stability of aggregation. The aggregates were more stable on the mulched plots and the degree of aggregation increased with increasing amounts of straw where 0, 2, 4, and 8 tons were applied. Roy C. Dawson has compared the effects of fungi, representing seven different genera, on the rate at which they break down organic matter of leguminous and non-leguminous residues. Some groups appear to be much more effective than others.

"A paper entitled, 'Effect of Crop Residues on Soil Temperature,' by T. M. McCalla and F. L. Duley, was accepted for publication in the Journal of Agronomy."

Runoff Studies - V. D. Young, Fayetteville, Arkansas.-"On the Bentonville Watersheds, the mean rainfall for the period January 1 to September 30 totals 61.69 inches. This is 17.6 inches greater than the 39-year average as recorded by the Weather Bureau Station for a 12-month period. A total of 11.37 inches of rain fell during the month of September on watersheds. The greater portion of this precipitation occurred on the 12th and 13th and from the 24th to the end of the month. Runoff occurred from all watersheds.

"The effect of vegetation and soil characteristics in controlling the amount of water lost during the period September 1 to September 26, inclusive, was as follows:"

Watersheds	Area (Acres)	Inches Rainfall	Inches Runoff	Soil and vegetation
W-I	10.03	8.72	3.696	Deep permeable medium texture corn standing. Drilled across slope.
W-II	9.34	9.26	1.492	Shallow gravelly permeable medium texture native pasture.
W-III	14.25	10.12	1.695	Deep gravelly reely permeable medium texture top half in corn. Bottom half in native pasture and brush.
W-IV	24.0	9.39	.471	Deep permeable coarse texture wooded with thick stand of underbrush.
W-V	19.4	8.77	.210	Deep permeable medium texture grass and weeds 18" tall, not cut or grazed in 1945.
W-VI	10.75	9.42	2.225	Deep slowly permeable medium texture red clover and grass meadow. Cut August 30th and hay removed.

Note: Soil characteristics added by D. B. Krimgold.

Runoff Studies - N. E. Minshall, Madison, Wisconsin.-"Precipitation for Edwardsville for the month was 7.78 inches of which 3.15 inches fell on the 13th. Due to the dry condition of the soil at the time of this rain, and the moderate intensities of the storms, the runoff for that day was only 0.21 inch. The total runoff for the month from the 50-acre pasture watershed was about 0.5 inch. Temperatures ranged from a high of 93 degrees on the 9th to a low of 46 degrees on the 29th.

"Precipitation for Fennimore was 4.22 inches all of which fell at moderate intensities, and there was no surface runoff. Temperatures ranged from a high of 88 degrees on the 5th to a low of 29 degrees on the 29th. The first killing frost of the season occurred on the 29th. Due to the late planting of corn, and the below normal temperatures during the summer months, about 1/2 of the crop in southwestern Wisconsin had not matured when this first frost came. This will result in a reduced yield and an inferior quality of the corn. Most of the corn on our watersheds, however, were far enough advanced so that it was not noticeably damaged."

Runoff Studies - H. K. Rouse, Colorado Springs, Colorado.- H. K. Rouse took over supervision of the runoff studies at Safford, Arizona; and Albuquerque and Sante Fe, New Mexico, from Mr. J. H. Dorroh, Jr., on September 10. We spent 2 weeks conferring with Mr. Dorroh and interested Regional personnel and visiting all watersheds on these three projects, in company with the observers. The records of these watersheds, formerly kept in Albuquerque, have been partly transferred to Colorado Springs, Colorado, and the transfer will be completed at an early date. No changes in observing personnel or methods used are contemplated at this time. During this trip we met with the State and District Conservationists cooperating in the work."

Runoff Studies - T. W. Edminster, Blacksburg, Virginia.-"A large portion of the month was spent in analyzing the plot and watershed data for the proposed Ridges and Valleys Hydrologic Report. An attempt is being made to develop a correlation between the peak rates of runoff on the control plots and the two Blacksburg watersheds. Initial study shows a break in the relationship when the runoff intensity on the plots falls below about 0.3 in./hr. Nine additional storms during 1942 are now being analyzed to see if this trend is significant. The data from seven T. V. A. - Agricultural Experiment Station pasture watersheds has been analyzed and plotted on a log-log basis to check the frequency of occurrence of peak rates of runoff under pasture conditions in that area.

"A conference was held with T. V. A. engineers, W. H. Dickerson and R. E. McKnight, on the availability of additional hydrologic data from the Thompson Creek area in Southwest Virginia. Arrangements to get these data are now being worked out."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.- "Mr. Donnelly spent the entire month testing the rectangular spillway outlet and studying the data which he obtained. The height of the longitudinal and end sills has been set tentatively at one-sixth the tailwater depth. This will be verified or modified after a complete, tentative design has been made.

"Mr. Anderson made 12 runs on a lucite pipe-bleeder model. Two sensitive pressure recorders were used during these tests. One recorder, used as a control, was continuously connected to a piezometer located at the base of a vertical riser, 1.25 pipe diameters square and 5 pipe diameters deep. The other recorder was connected successively to each of 5 piezometers located along the barrel. The barrel, 4-1/2 inches in diameter, is set on a 30 percent slope and is 20 pipe diameters (90 inches) long.

"Mr. Blaisdell spent considerable time on the transition study. The test platform was remodeled to permit it to be more accurately leveled. The theory, as developed, assumes that hydrostatic pressure exists within the transition. However, this assumption is not valid. An attempt was made to develop a vertically curved floor that would maintain a pressure on the bottom of the jet equal to the hydrostatic pressure. Two curved floors were constructed, but tests have not yet been completed."

Hydraulic Studies - D. D. Smith, McCredie, Missouri.-"Analysis of the terrace-outlet-channel test data has been completed and curves drawn, from which tables of outlet size will be prepared. A technical paper covering the work will be written. Seeding of channels 7, 8, and 9 was completed September 20.

"Mr. Zingg has completed his paper, 'Flood Control Aspects of Farm Ponds', for publication, and also a paper entitled 'Tile Lines for the Auxiliary Protection of Terrace Outlets.'

Hydraulic Studies - Stephen J. Mech, Prosser, Washington.- "In preparation for conducting test on the influence of furrow stream size on the erosion and irrigation characteristics of a perennial crop, a new seeding of alfalfa is being established on the plots occupied by potatoes earlier in the season. Similar data have been obtained for corn and for potatoes. Similar data is desirable for alfalfa to round out the picture. A formal amendment to the present work plan will be submitted in the near future.

"Irrigating a slope of 7 percent on the 'contour' produced more No. 1 potatoes than did irrigating straight down the slope. The potatoes from the plots irrigated across the slope with a grade of 2 percent in the furrows graded 74.8 percent No. 1's, while the plots irrigated straight down the steepest part of the slope produced only 66.2 percent

No. 1 potatoes. Though the total yields were 9.7 and 9.3 tons per acre for the 'contour' and downhill plots, respectively, the yield of marketable potatoes varied considerably more."

1945 Potato Yield in Tons per Acre

Section of Plot	U. S. Grade Number No. 1	No. 2	Culls	Total Yield
	Furrow Grade = 7 Percent			
Upper Half	7.25	2.80	0.55	10.6
Lower Half	5.05	2.40	.45	7.9
Plot Average	6.15	2.60	.50	9.3
	Furrow Grade = 2 Percent			
Upper Half	7.47	2.06	0.37	9.9
Lower Half	7.06	1.96	.48	9.5
Plot Average	7.26	2.01	.42	9.7

Hydraulic Studies - Vito A. Vanoni, California Institute of Technology, Pasadena, California.-"Laboratory studies of spillway Plans III and IIIa for Lake Carl Blackwell were completed and a memorandum report of conclusions and recommendations were forwarded to the Fort Worth office. This spillway contracts from a width of 250 feet at the crest to 80 feet at the stilling basin. The contraction is accomplished by walls following a circular curve joining the ends of the crest with the walls of the stilling basin. The only difference between Plans III and IIIa is in the length, Plan III giving a length of 581 feet and Plan IIIa 511 feet.

"Copies of Laboratory Report TR-65-CP-R-1, 'Hydraulic Model Tests of Lake Coffee Mill Spillway' are available for loan within the Soil Conservation Service."

Sedimentation Studies - Carl B. Brown, Washington, D. C.-"An analysis was made of rates of sediment production of the glacial till plain area of the Upper Mississippi in Missouri River watersheds. This information was furnished to engineers concerned with the design of certain stream-control works on the Missouri River.

"An inspection was made in company with Regional technicians of the Experimental plantings of a vegetative screen in the Paper Mill Pool at the upper end of Loch Raven Reservoir, a part of the water-supply system of Baltimore. A conference was held at Upper Darby, Pa. relative to the preparation of an interim report on the evaluation of bank-control works on the Winooski River, Vermont.

"A discussion of the paper entitled 'Life of Lake Mead and Elephant Butte Reservoir' by J. C. Stevens was revised in accordance with suggestion of the editors. An article by C. B. Brown entitled 'Erosion is Menace to Water Supply', was published in the September issue of Southern City magazine."

Sediment Studies - Vito A. Vanoni, Cooperative Laboratory, California Institute of Technology, Pasadena, California.-"Project Report TR-75-CF-R-1 by Hans Albert Einstein, entitled 'Sediment Movement in Wildwood Canyon' was distributed to the Washington office and to the regional engineers. This report is of general interest in that it demonstrates a method of approach to sediment-control problems in mountain streams. By using sediment-transportation formulas to estimate the sediment loads carried by the mountain streams, it is possible to design a channel system that will be in equilibrium with the sediment load reaching the system. In the case of Wildwood Canyon the analysis showed that in its natural regime, there was a debris or sediment storage area and that all of the sediment entering the system was not carried through. The use of this natural feature in the control plan for the stream was essential to its success. The final recommendations were based principally on interpretations of natural evidence found by field studies of the problem, and serve to illustrate how reasonable solutions to such problems may be obtained from such field studies."

Drainage Studies - R. E. Morris, North Liberty, Indiana.-During September, beets, potatoes, and sweet corn from the drainage plots were harvested and graded. Yield calculations are not completed but the potato yields are tabulated below:"

Plot No.	Yield, bu. per acre Grade #1	Grade #2
Inches		
1 -45	181	8
8 -45	160	6
2- var.	159	9
7-	145	7
3 -30	23	2
6 -30	108	5
4 no stand		
5 -15	15	6

Drainage Studies - C. Kay Davis, The Everglades Project, Fort Lauderdale, Florida.-"The hurricane came in below Miami and curved in a northwest direction but did not come very close to Lake Okeechobee, so the R-E curve still holds good so far as the Lake Okeechobee area is concerned since that is the area represented by the formula.

"The rains in the Lake area practically destroyed the early plantings and are causing some comment relative to additional canals for draining the Lake area. The Lake level is now about 16.5, Okeechobee datum, and with the high water table in the Kissimmee Valley it will likely approach 17.0 soon after the first of October.

"Since preparations have been made for use of two sections for cultivation this year, it may be possible that we can obtain some data as to the relative advantages and disadvantages of ditch spacing. Perhaps we can get some idea from the farmers themselves as to the efficiency of both designs for relieving excess waters and later on we can get a report on the irrigation value of the different ditch spacings. The ditches in Section 10 were spaced at 1/8-mile intervals whereas the ditches in Section 4 were spaced at 1/4-mile intervals. We should get some worthwhile information on ditch spacing from this farm this year."

IRRIGATION DIVISION

Imperial Valley Drainage Investigation, California - Tile-drain study - W. W. Donnan reports.-"We received from Dr. M. L. Nichols the translation of a portion of a Dutch paper by S. B. Houghoudt. The work done by Mr. Houghoudt is very similar to the study made here with the large tank. Mr. Houghoudt's basic formula for tile spacing is identical with the one put forth by the project here. An analysis of the paper reveals that similar obstacles were encountered in trying to get a correlation of spacing with the formula, in the tank runs. By introducing the theory that flow laterally also occurs in a part of the capillary area above the phreatic surface in the soil and applying this correction to the area of flow, very good correlations were obtained in trials made in the Dutch tank by Houghoudt. Five of our trials in the tank here were recalculated using the correction suggested in the Houghoudt paper. We have secured very good results. This information changes the whole outlook regarding the spacing formula. It would seem that our formula, as proposed, does have considerable merit and if partially modified by the Houghoudt correction it may prove applicable to our field work. I feel that this translation of the Houghoudt work can be used further because the author goes into the matter of stratified soils at some length and we may be able to adopt some of his formulas without making exhaustive tests of stratified soils in the tank here in El Centro. In fact the apparent success to date with our laboratory checks of our formula indicates that we may be in a position to inaugurate actual field trials using our formula to dictate the spacing."

Vladimir S. Aronovici reports.-"Special studies were made of the falling-head permeameter, utilizing the formula as set up by Dr. Israelsen for application to field problems of very low percolation rates. Very satisfactory results were obtained for rates as low as 0.001 cc/cm.^{2}/hr. Low rates of this type cannot be run effectively by our standard constant-head permeameter. Several additional standard permeameter runs were completed, bringing our present total to 220 runs of Imperial Valley material."

Studies of Needs, Methods and Practices for the Rehabilitation of Irrigation and Drainage Enterprises - Utah Drainage Districts - J. H. Maughan reports.-"I spent a week reviewing background material for a Utah Drainage District Project. Study was made of the law governing districts, their organization, and responsibilities. Information available at the Utah Agricultural Experiment Station on drainage in Utah was secured and read. Some thought was given to preparation of a detailed work outline for the project.

"Drainage is an old problem on the Lower Sevier River. The land is low and flat and the soils are usually fine. The need of drainage was recognized by the early irrigators. The Sevier Bridge Reservoir was built and the irrigated area greatly expanded. The increased irrigation soon emphasized the need of drainage. Wide areas of old and new

farm lands became waterlogged and something had to be done to get rid of the excess water. Between 1914 and 1918 four drainage districts were organized and tile drains were installed in more than 80,000 acres. In the enthusiasm, wide areas of non-farming land were included in the drains. The next two decades were a period of difficult times for farmers and creditors alike at Delta. Owners of poor lands failed to pay drainage obligations and the financial burden of the over-extended system soon fell on the remaining farm lands. Aggravating this condition the tile lines did not work well. Many lines became clogged and great dissatisfaction with the project spread among the farmers. Before 1930 all districts had failed. Then started a series of litigation proceedings during which time farmers, in fear of losing their farms, allowed their operations to fall off and their places to run down. The drains were not kept open and the drainage system became largely inoperative. This was a period of severe depression for farming in the Delta area. By 1937 the law suits were settled; however, not without great financial loss to both creditor and debtor. In 1938 there began a new era for the Delta. Drainage districts began the installation of a system of open drains. Main lines were installed first and laterals were then put in so as to cut the tile lines and get whatever benefit that might result from opening these lines. The installation of the open-drain systems, still in progress, has been directed at first by constructing lines of general benefit and working back to reach the areas most in need of relief. The work has been mainly carried on a pay-as-you-go basis with year-to-year credit supplied by local banks. After 30 years of experience the general feeling among farmers in the area seems to be that the new approach is sound and effective. However, it is recognized by most of the leaders that many of the drainage problems in the Delta area have not yet been answered. There is need to study the effectiveness of the new drainage system and possible means of improving it."

Design, Invention and Testing of Irrigation and Drainage Apparatus - R. L. Parshall reports.-"We now have our new bulletin available, entitled 'Improving the Distribution of Water to Farmers by Use of the Parshall Measuring Flume.' This is Colorado Experiment Station Bulletin No. 488. I am sure it will prove a useful publication, especially for those having to do with the administration of irrigation water, and it is hoped that it will be the means of extending the use of our flume in bettering the distribution of water to farmers."

Efficiency of Irrigation Methods for Different Problem Areas - Wheeler-Case project, Montana.-J. S. James reports a trip to the Wheeler-Case projects near Clendive. A particular objective of this trip was to observe something of the land-development work carried on by the Wheeler-Case program. Mr. James says that experience with this work has indicated some tentative conclusions: It accelerates the process of getting new irrigation into production, and some of the hazards of farming new land are removed or at least some of the uncertainties

are resolved earlier, reducing the risk of new settlement. The effects of shifting part of the topsoil in grading the land are not yet clearly evident in full detail. However, it seems apparent that any detrimental effects of land leveling can be largely avoided, but only through careful control in full consideration of soil and subsoil types and textures. Such control of land grading has been developed on the 'Buffalo Rapids' projects. It requires detailed surveys and studies of the soil, but the cost of this work seems fully justified by saving in costs of land leveling and by assurance that soils will not be permanently injured by ill-considered removal and shifting of topsoil, and by exposure of subsoil with materially different hydraulic properties. Mr. James points out that the purposes of land development under the Wheeler-Case program are essentially the same as those of the conservation program which is being initiated on irrigated and irrigable lands by soil-conservation districts under technical guidance by the Service. In both cases, the purpose is to facilitate the best use of the soil and water resources. In cases where Wheeler-Case project areas are included in conservation districts with which the Service is cooperating, the programs are identical. They are differentiated only by the means of financing and carrying out the work. The requirements for technical guidance are the same in both programs.

"In the course of several years' experience in the 'Land Utilization' program and later in the Wheeler-Case program, the technical requirements for proper development of land under irrigation have been developed in considerable detail. The District program on irrigated land is relatively new and has not as yet been able to fully develop technical procedure. It may benefit materially from the experience gained by the more specialized work of the W-C organization. The individual farm is the 'end point' in both programs. However, its development is tied in with - is a part of - the development of the area. Generally, the first approach of the W-C program has been to the area, as defined by the project. Farm-unit development evolves as subdivisions of the area. On the other hand, the District program first encounters the individual farm, and the area development will be the total or composite of that of the individual units. In the one case, an area is planned for subdivision into farm units; in the other, farm units are planned to fit into and make up the final area pattern. Under irrigation, consideration of the individual farm and of the area are inseparable. The only purpose of developing an area is to provide for farm units, and the development of the area. The planning of an irrigation area is, in large part, the interpretation and application of facts, principles, and relationships that have been developed by research. It may be that, in the growing recognition of the need for such planning, there will be increasing calls upon the Division for assistance."

Oregon and Washington - E. C. Gwillim reports.-"The field investigations in the Methow Valley were completed. Several ranchers, farmers, and orchardists were contacted in the Valley to ascertain their irrigation practices. The general opinion seemed to be that the water

requirement for crop production is 6 acre-feet per acre. A summary of my findings and suggested recommendations will be prepared in the near future. The field investigations in the Methow Valley were discussed with Mr. Haanum, District Conservationist."

Evapo-Transpiration Losses Affecting Irrigation Practices - Santa Ana River Cooperative Investigation, Calif. - Dean C. Mucket reports.-"Some time was spent with Mr. Scott of the United States Geological Survey discussing the behavior of the water table in the canyon area below the Santa Ana Valley Irrigation Company canal intake. There is evidence that the withdrawal rate by pumping is much faster than the rate of recharge. Some of the newer wells have not produced as much water as expected and at the same time have caused a decrease in the production of the older wells. In spite of this condition, more land is being leveled for irrigation and more wells are contemplated by the land owners. The ground-water unit is completely recharged each winter but its capacity is not sufficient to provide carry-over storage for the amount of pumping. Both the Santa Ana Valley Irrigation Company and the Anaheim Union Water Company pump in this area to supplement their gravity supplies."

San Luis Rey Investigation, Calif. - Mr. Muckel reports.-"Well-production records were obtained from the City of Oceanside and Carlsbad Mutual Water Company. All of this water is exported from San Luis Rey Valley and is being included in the computations of inflow-outflow studies as a check on the consumptive use as arrived at by the integration method.

"A plan to replenish wells in Mission Basin as proposed by Mr. S. D. Fraser, Manager of the Carlsbad Mutual Water Company, was discussed with him. He proposes to direct surface water into abandoned wells or spread on the ground surface during the winter months. The plan did not appear feasible to me because the ground-water table stands only 10 feet below the ground surface during the winter and consequently there is no storage capacity for additional water. According to information collected during our field work, the Basin is fully recharged each year by natural percolation of rainfall or stream flow. During the summer months the drawdown in certain wells is about 80 feet and replenishment at this time would be desirable but no water is available then."

Snow Surveys and Irrigation Water-Supply Forecasts - R. L. Parshall reports.-"I have completed my discussion relative to the Los Angeles meeting of the Colorado River Water Forecast Conferences held last April 16. As previously reported, my final conclusions as to the forecasting of the summer flow in the Animas River for southwestern Colorado, based on fall flow relations, show that of the 18 years, 1927-1944, inclusive, for 16 years the deviation between the actual and forecasted flows was less than 25 percent. If this method of determining the probable trend of the coming summer's runoff can be determined as early as January, this will prove a valuable tool in guiding our judgment in making the forecasts as based on snow cover."

Carl Rohwer, in commenting on the snow-survey work in Arizona, says.- "Most of our snow courses in Arizona are at relatively low elevations and this may explain the poor correlation between water content of snow and runoff. The highest mountains in Arizona are the San Francisco Peaks near Flagstaff. These peaks are over 12,000 feet high and are in an area where considerable snow falls. The runoff is into the Little Colorado River and the Verde. From our experience elsewhere as to the significance of the records of the San Francisco Peaks might serve as an index of snow cover in Arizona more effectively than many low courses. This possibility was considered during our recent inspection of the courses in Arizona but time was not available for locating these high courses this season."

Storage of Water Underground for Irrigation - Antelope Valley, Calif. - Dean C. Muckel reports.-"Mr. Ed Core, Zone Technician, visited the office on the 27th and said that the soil-conservation district directors have requested plans for a spreading system at the mouth of Kings Canyon in Antelope Valley. Mr. Core sketched a rough plan of the proposed system. It will consist of 80 gross acres divided into 20 basins of about equal size formed by contour dikes. The water supplying each basin will be controlled by a gate or valve. The City of Los Angeles has agreed to install a 30-inch outlet in the Owens River Aqueduct and the District is to do all other work. It is expected that approximately 50 second-feet can be delivered to the spreading area. The City makes no promises that water will be available but if water does become available, by reason of a heavy snowfall in Owens Valley, the City will agree to release excess water at this point. The District is making plans on the basis that 50 second-feet will be available for spreading for about 3 months. Mr. Core said that final plans for the spreading system will be sent here for checking as soon as they are completed. The design is being based on the results of experimental work done last year at the same location."

11-13-45